III. STATUS OF CLAIMS

Claims 1-14 are pending in the application. The claims under appeal are 1-14 as set forth in the Claims Appendix below.

IV. STATUS OF AMENDMENTS

No amendment was filed after the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to a parallel flow heat exchanger designed for use with two-phase refrigerant and having a plurality of channels that extend into the inlet manifold at varying depths for the purpose of creating enough momentum of the vapor phase to carry the droplets of liquid and distribute them uniformly among the channels, create different flow resistance for vapor and liquid phases, and provide mixing of the two-phases to create homogenous flow.

The following is a concise explanation of the subject matter defined in claims 1, 3-6, 8 and 10-13.

Claim 1

A parallel flow heat exchanger comprising:

an inlet manifold (page 5, paragraph 21, line 3, Fig. 2, reference 11) having an inlet opening (page 5, paragraph 21, line, 5, Fig. 2, reference 14) for conducting the flow of two-phase fluid into said inlet manifold and a plurality of outlet openings (page 5, paragraph 22, lines 4 and after, Fig. 2, no reference number) for conducting the flow of fluid from said inlet manifold;

a plurality of channels (page 5, paragraph 21, lines 2 and after, Fig. 2 references 24, 26 and 27) aligned in a substantially parallel relationship and fluidly connected to said plurality of outlet openings for conducting the flow of two-phase fluid from said inlet manifold (page 5, paragraph 22, lines 4 and after, Fig. 2, no reference number);

an outlet manifold fluidly connected to said plurality of channels for receiving the flow of two-phase fluid therefrom (page 7, paragraphs 28, lines 2 and after, Fig. 5, reference 41);

wherein said plurality of channels extend into said inlet manifold at varying depths (page 5, paragraph 21, lines 2 and after, Fig. 2, references 24, 26 and 27).

Claim 3

A parallel flow heat exchanger as set forth in claim 2, wherein said parallel channels are divided into sections with each section having equal extension depths and the depths of extension into said inlet manifold decreasing from section to section toward the downstream end of the inlet manifold (page 5, paragraph 23, lines 3 and after).

Claim 4

A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels are substantially flat in planes transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section areas of said inlet manifold are locally enlarged in the vicinities of those areas surrounding said flat channels to allow for the flow of refrigerant around said plurality of channels (page 6, paragraph 26, lines 3 and after, Fig. 4a).

Claim 5

A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels are substantially flat in planes transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of an oval shape (page 6, paragraph 27, lines 1 and 2, Fig. 4b, reference 37).

Claim 6

A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels is substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of a rectangular shape (page 6, paragraph 27, lines 1 and 2, Fig. 4c, reference 38).

Claim 13

A parallel flow heat exchanger as set forth in claim 8, wherein said plurality of channels is substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of a rectangular shape (page 6, paragraph 27, lines 1 and 2, Fig. 4c, reference 38).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Ground 1

Claims 1-3, 7-10 and 14 stand rejected under 35 U.S.C. 102(b) as being anticipated by Yasunori (JP 2001-304775A).

Ground 2

Claims 4-6 and 11-13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yasunori in view of Kato et al. (6,988,539).

VII. ARGUMENTS

Ground 1

Rejection of Claims 1-3, 7-10 and 14 as being anticipated by Yasunori.

To anticipate a claim, the reference must teach each and every element of a claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. V. Union Oil of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Claims 1 and 8

The Yasunori reference relates to a heat exchanger designed or use with a single-phase medium (water, in particular) and specifically for heating in automotive applications. The tubes in the heat exchanger are so structured as to create different hydraulic resistance to distribute the water flow uniformly between the channels. Although the structure bears some similarity to the applicant's, the theory behind it and

the purpose and manner of operation is substantially different from that of applicants. That is, because the cited reference relates only to a single-phase (i.e. water distribution) and is concerned with hydraulic resistance, the principals involved and thus the structure is different from the present invention wherein both liquid and vapor are involved. For example, since vapor and liquid have different properties (such as density, viscosity, etc.) they move at different velocities and have to counteract forces (such as gravity) that affect the two-phases differently. The present invention therefore creates enough momentum to carry the droplets of liquid and distribute them uniformly among the channels.

Claims 1 and 8 recite an inlet manifold having an inlet opening for conducting the flow of two-phase fluid, said inlet manifold and outlet manifold fluidly connected to said plurality of channels for receiving the flow of two-phase fluid therefrom wherein said plurality of channels extend into said inlet manifold at varying depth". Although the Yasunori reference shows a plurality of channels extending into the inlet manifold at varying depths, that reference does not show or suggest the use of the apparatus with a two-phase fluid, but rather relates only to apparatus for use with a single-phase medium, i.e., water. In this regard, the Examiner has said that "Regarding two-phase fluid, the Examiner considers it is an intended use of a two-phase fluid with a heat exchanger and the constructional Fig. 1 of Yasunori's heat exchanger being similar to that applicant's heat exchanger Fig. 2, the two-phase fluid can be also used with Yasunori's heat exchanger. In addition, the heat exchanger can be an evaporator. (See U.S. Patent 6,988,539 to Kato et al., column 1, lines 17-18). An evaporator while receiving refrigerant after its expansion through an expansion valve receives two-phase fluid. Therefore, the basis of using a heat exchanger as an evaporator it can receive two-phase fluid." The applicants respectfully disagree.

Firstly, the Yasunori reference does not show or suggest the use of a two-phase fluid and in fact describes the heater core as being designed for the flow of hot water therethrough. Neither does that reference suggest that the Yasunori heat exchanger be used as an evaporator. Secondly, in view of the purpose, structure and manner of operation, i.e. the passing of warm water therethrough for the heating of a car, the

appellants believe that there is absolutely no basis for the Examiner's position that an intended use of the apparatus is with a two-phase fluid. Although it is possible to use two-phase fluid with the Yasunori heat exchanger, because it was designed for use with liquids, it would not be practical to use the Yasunori heat exchanger with a two-phase fluid.

The Examiner has stated that "Apparatus claims must be structural distinguishable from the prior art" and cites in re Schreiber in support thereof. In that case, it was found "The absence of a disclosure in a prior art reference relating to function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference".

In contrast, in the present case, the appellant's claimed features are not inherent in the Yasunori apparatus. In the appellant's claim 1, for example, each of the inlet manifold, the plurality of channels, and the outlet manifold are recited as having structure for conducting the flow of two-phase fluid. The Yasunori reference does not have such structure.

The Examiner has said that "The heat exchanger of Yasunori is able to make uniform distribution of both two-phase fluid and a single phase fluid to effect uniform distribution of temperature. Therefore using a single phase fluid or a two-phase fluid is an intended use of the fluid with the Yasunori type heat exchanger having the same feature of invention". In this regard, the appellants believe that the Examiner has no basis for this conclusion since the entirety of that patent is directed to a heat exchanger having a warm fluid flowing therethrough for the transfer of heat to a vehicle. Clearly there is no intended use of a two-phase fluid in that apparatus nor would it be practical to do so.

Although the Examiner has rejected claim 1 on the basis of Yasunori, by itself, he has referred to the Kato et al. reference to teach that the heat exchanger can be an evaporator. In this regard, it should recognized that the Kato et al. reference mentions only in the background discussion of the prior art that a heat exchanger can be used as an evaporator. That reference does not show or suggest the use of a two-phase fluid

nor even the use of a heat exchanger as an evaporator. Rather, it describes a heat exchanger which is used as a condenser.

By the mentioning of the Kato et al. reference is connection with the 102 rejection of claim 1, the Examiner may be inferring an obvious combination of the two references for the purpose of a 103 rejection. In this regard, because of the differences in single-phase and two-phase fluids as discussed hereinabove, the applicants contend that it would not be obvious to combine the features of the Kato et al. reference with that of the Yasunori reference to obtain the present invention as may be suggested by the Examiner. Even if they were combined, they would not result in the Applicant's invention. That is, to simply insert the flat tubes of the Kato et al. reference in the apparatus of the Yasunori reference would not result in the applicant's invention as now claimed.

Claims 3 and 10

Dependent claims 3 and 10 recite the features wherein the parallel channels are divided into sections with each section having equal extension depths and the depths of extension into the inlet manifold decrease from section to section toward the downstream end of the inlet manifold. In contrast, the Yasunori reference does not divide the channels into sections with each section having equal extension depths but rather shows that each of the tubes is at a different insertion depth. Accordingly, that reference does not teach every element of the claim as required under Section 102.

Claim 13

Dependent claim 13 recites the further feature wherein the plurality of channels are substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-sectional area of the inlet manifold is of a rectangular shape. Clearly, these features are not shown or suggested by the Yasunori reference, and that reference does therefore not teach each and every element of the claim as required by Section 102.

Ground 2

Rejection of claims 4-6 and 11-13 as being unpatentable over Yasunori in view of Kato et al.

According to the MPEP 2143, three basic criteria must be met to establish a prima facie case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. All of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, MPEP 2143.03. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). We believe that the Examiner has not met the basic requirements for establishing a prima facia case of obviousness.

The Kato reference shows a flat tube heat exchanger in a rather conventional design. It does not show or suggest the different length tubes in the inlet manifold as a solution to the problem of unequal distribution in the various channels.

Claims 4 and 11

Dependent claims 4 and 11 recite the further feature wherein the plurality of channels are substantially flat in planes transversed to the longitudinal axis of the inlet manifold and further wherein the cross-sectional areas of the inlet manifold are locally enlarged in the vicinities of those areas surrounding the flat channels to allow for the flow of refrigerant around the plurality of channels.

While the Kato et al. reference does show the use of flat channels, it clearly does not show or suggest that the cross-sectional areas of the inlet manifold are locally enlarged in the vicinity of those areas surrounding the flat channels as clearly recited in

claim 4. To simply insert the flat tubes of Kato et al. in the Yasunori reference as suggested by the Examiner would not result in the applicant's invention as claimed.

Claims 5 and 12

Dependent claims 5 and 12 recite the further feature wherein the plurality of channels are substantially flat in planes transversed to the longitudinal axis of the inlet manifold and further wherein the cross-sectional area of the inlet manifold is of an oval shape. Neither the Yasunori reference nor the Kato et al. reference, taken individually or in combination show or suggest such a feature.

Claims 6 and 13

Dependent claims 6 and 13 recite the further feature wherein the plurality of channels is substantially flat in a direction transversed to the longitudinal axis of the inlet manifold and further wherein the cross-sectional area of the inlet manifold is of a rectangular shape. Again, neither of the cited references taken individually or in combination show or suggest such a feature.

VIII. CLAIMS

For these reasons discussed hereinabove, the appellants believe that the Examiner has not met his obligation of establishing a *prima facie* case and that the rejections should be reversed. Such reversal is respectfully requested.

Dated: April 18, 2007

Respectfully submitted,

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CLAIMS APPENDIX

1. A parallel flow heat exchanger comprising:

an inlet manifold having an inlet opening for conducting the flow of two-phase fluid into said inlet manifold and a plurality of outlet openings for conducting the flow of fluid from said inlet manifold;

a plurality of channels aligned in a substantially parallel relationship and fluidly connected to said plurality of outlet openings for conducting the flow of two-phase fluid from said inlet manifold;

an outlet manifold fluidly connected to said plurality of channels for receiving the flow of two-phase fluid therefrom;

wherein said plurality of channels extend into said inlet manifold at varying depths.

2. A parallel flow heat exchanger as set forth in claim 1, wherein the depths of extension into said inlet manifold for said plurality of channels decrease toward the downstream end of the inlet manifold.

3. A parallel flow heat exchanger as set forth in claim 2, wherein said parallel channels are divided into sections with each section having equal extension depths and the depths of extension into said inlet manifold decreasing from section to section toward the downstream end of the inlet manifold.

4. A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels are substantially flat in planes transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section areas of said inlet manifold are locally enlarged in the vicinities of those areas surrounding said flat channels to allow for the flow of refrigerant around said plurality of channels.

5. A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels are substantially flat in planes transverse to the longitudinal axis of

the inlet manifold and further wherein the cross-section area of said inlet manifold is of an oval shape.

6. A parallel flow heat exchanger as set forth in claim 1, wherein said plurality of channels is substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of a rectangular shape.

7. A parallel flow heat exchanger as set forth in claim 1 wherein said plurality of channels extend into said outlet manifold at varying depths.

8. A parallel flow heat exchanger of the type having an inlet manifold fluidly interconnected to an outlet manifold by a plurality of parallel channels for conducting the flow of a two-phase fluid therethrough and adapted for having a second fluid circulated thereover for purposes of exchange of heat between the two fluids;

wherein said plurality of parallel channels extend into said inlet manifold at varying depths.

9. A parallel flow heat exchanger as set forth in claim 8, wherein the depths of extension into said inlet manifold for said plurality of channels decrease toward the downstream end of the inlet manifold.

10. A parallel flow heat exchanger as set forth in claim 9, wherein said parallel channels are divided into sections with each section having equal extension depths and the depths of extension into said inlet manifold decreasing from section to section toward the downstream end of the inlet manifold.

11. A parallel flow heat exchanger as set forth in claim 8, wherein said plurality of channels are substantially flat in planes transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section areas of said inlet manifold are locally enlarged in the vicinities of those areas surrounding said flat channels to allow for the flow of refrigerant around said plurality of channels.

12. A parallel flow heat exchanger as set forth in claim 8, wherein said plurality of channels is substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of an oval shape.

13. A parallel flow heat exchanger as set forth in claim 8, wherein said plurality of channels is substantially flat in a direction transverse to the longitudinal axis of the inlet manifold and further wherein the cross-section area of said inlet manifold is of a rectangular shape.

14. A parallel flow heat exchanger as set forth in claim 8 wherein said plurality of parallel channels extend into said outlet manifold at varying depths.

EVIDENCE APPENDIX

Not Applicable.

RELATED PROCEEDINGS APPENDIX

Not Applicable.